PATENT CLAIMS

1. Method for precise working of material, particularly organic tissue, in which laser pulses with a pulse length between 50 fs and 1 ps and with a pulse frequency from 50 kHz to 1 MHz and with a wavelength between 600 and 2000 nm act on the material to be worked

2. Method for precise working of material according to claim 1, wherein the energy of the individual pulses is between 100 nJ and 5 μJ.

3. Method for precise working of material according to claim 1 or 2, wherein the laser pulses are focused on or in the material and the focal points are guided in three dimensions.

4. Method for precise working of material according to claim 3, wherein the focus points are guided in such a way that a substantially cohesive cut surface is generated in the material.

5. Method for precise working of material according to claim 4, wherein a second cut surface is generated in the material and, together with the first cut surface, surrounds an essentially lens-shaped portion of material.

6. Method for precise working of material according to claim 5, wherein additional cut surfaces are generated in the severed portion of material.

7. Method for precise working of material according to claim 4 or 5, wherein at least one cut is generated between the material surface and the severed portion of material.

8. Method for precise working of material according to claim 5 or 6 in combination with claim 7, wherein the at least one portion of material is extracted from the material through the at least one cut.

9. Method for precise working of material according to one of claims 3 to 8, wherein the time interval between the laser pulses is varied depending upon the location of the focus point.

10. Method for precise working of material according to claim 3 or 9, wherein the speed at which the focus points are guided is varied depending upon the location of the focus points.

11. Apparatus for precise working of material, particularly organic tissue, with a pulsed laser, wherein the laser has a pulse length between 50 fs and 1 ps and with a pulse frequency of 50 kHz to 1 MHz.

12. Apparatus for precise working of material according to claim 11, wherein the energy of the individual laser pulses is between 100 nJ and 5 μJ.

13. Apparatus for precise working of material according to claim 11 or 12, wherein beam devices for beam shaping and/or beam control and/or beam deflection and/or beam focusing are further provided.

14. Apparatus for precise working of material according to claim 11, wherein the beam devices are programmable.

15. Apparatus for precise working of material according to one of claims 11 to 14, wherein holding devices are further provided for positioning and/or fixating the material to be worked.

16. Apparatus for precise working of material according to one of claims 11 to 15, wherein a work beam of the radiation source can be applied to the material or in the material by means of the beam devices in geometrically predefinable shapes in a time sequence that can be predetermined.

17. Apparatus for precise working of material according to claim 16, wherein the pulsed work beam can be applied to the material by the beam deflection device, during which time the repetition rate can be modified.

18. Apparatus for precise working of material according to one of claims 11 to 17, wherein the laser is a fiber laser.

19. Apparatus for precise working of material according to one of claims 11 to 17, wherein the laser is a disk laser.

20. Apparatus for precise working of material according to one of claims 11 to 17, wherein the laser is a combination of fiber laser oscillator and disk laser amplifier.

21. Method for precise working of material according to claim 7, wherein the length of the cut between the material surface and the material portion along the material surface is appreciably smaller than the circumference of the material portion.

22. Method for precise working of material according to claim 8, wherein the material portion is divided into small fragments and the extraction of these fragments is carried out by means of a suction/rinsing device.

23. Use of an apparatus according to claims 11 to 19 for refractive surgery.